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ALBERTA'S SPECIAL WASTE MANAGEMENT PROGRAM

by

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Background

The Alberta Special Waste Management System is the result of close to ten years of effort by Alberta's government, industry and public at large. In the late 70's and early 80's the Alberta government set as its priority the development of an appropriate province wide program for the management of hazardous wastes. The cornerstone of the resultant special waste management system is the Treatment Centre, sited and built near Swan Hills. The system also includes a province wide collection, transfer and transportation network.

Following site selection in early 1984, the Alberta government created the Alberta Special Waste Management Corporation. This corporation is an Alberta Crown Agency, mandated to "establish and ensure the safe operations of facilities to deal adequately with Alberta's hazardous wastes".

In developing the Special Waste Management Program, objectives included that the resultant system would have to meet the following criteria:

- The treatment centre be comprehensive and integrated so that all Alberta wastes could be completely treated at one location.

- The site be accessible to all Albertans. Geographically this would be addressed through the development of a comprehensive collection and transportation system. Financially a postage stamp rate concept would be incorporated for transportation so that no user would be unfairly burdened due to location.

- "State-of-the-art" technology be incorporated in the plant design.

- The site be both technically sound as well as socially acceptable.

The Alberta Special Waste Management Corporation (ASWMC) entered into a joint venture agreement with Bow Valley Resource Services Ltd. to develop and own the facility. Through this joint venture, Chem-Security (Alberta) Ltd. (CSAL) was contracted to build and operate the facility. As well, CSAL supervises the transfer and collection stations and manages the transportation system.

Facility Design Criteria

Design of the treatment centre required knowledge of both the volumes and types of waste which would require treatment. Waste inventories suggested that Alberta produced some 100,000 to 200,000 tonnes of hazardous waste annually. Based on European experience and advice, it was expected that some 20% of this material might require off-site treatment. Therefore, a conservative initial design capacity was set at 20,000 tonnes annually, in two phases. The first phase considers 10,000 tonnes of organic materials and 5,000 tonnes of inorganic materials. In addition, the plant was designed to treat any hazardous waste produced in Alberta excepting explosives and radioactive materials.

Four main guidelines were adopted in facility design; including:

- Build Small - plant capacity can always be expanded if needed.

- Build Flexible - by minimizing the interdependence of treatment processes the facility can more easily accommodate process modifications or additions.

- Use Modular Components - standardizing facility components as much as possible ensures easy access to replacement or additional parts, and minimizes design and engineering costs.

- o Review New Options - because of the dynamics of treatment technologies in the waste management field, new technologies would be reviewed on an ongoing basis to ensure any further developments of the treatment centre take advantage of the latest proven technologies.

The Treatment Centre

The treatment centre, located some 250 kilometers northwest of Edmonton near the town of Swan Hills, was officially opened in September 1987.

The main treatment processes comprising the facility include:

- o high temperature incineration
- o physical/chemical treatment, and
- o stabilization.

Following treatment, the non-hazardous solid residues are placed in a covered secure landfill cell and the treated waste waters are injected down a deepwell.

To enter the system, waste generators must disclose the chemical composition of their waste and submit a sample of the same to the treatment centre. The samples are analyzed to confirm their composition and to decide upon the appropriate handling, treatment and disposal procedures. At this point a contract is completed and the waste is scheduled for treatment. Once the waste enters the Alberta system, ownership and liability are transferred to the Special Waste Management System.

The transportation system which links the collection network with the treatment centre is coordinated with the treatment centre's scheduled operating plans. Drummed wastes are transported within steel, marine style containers. Drained PCB contaminated transformers are transported within drip trays on covered flat beds. Liquid tankers are used to move bulk liquids and diaphered dump trucks are used to transport low-level contaminated soils.

Organic wastes such as solvents, pesticides, oils and PCBs are destroyed using high temperature incineration. The incineration facility consists of two rocking kilns, each with a dedicated secondary combustion chamber, and a common flue gas purification system. The rocking kilns can accept liquids, sludges and solids which may be fed simultaneously. The kiln rocks through an angle of about 90° to provide the solids mixing. Periodically the kiln is rotated through an angle of 180° to discharge slag and ash.

Gases from the kiln are routed through the secondary combustion chamber which operates at a minimum of 1200°, burning fuel gases only. The exhaust gases from each secondary combustion chamber are combined and routed through the flue gas purification system. This system first quenches the gases from 1200° to 80°C, then removes particulates and acid gases prior to releasing the gases to atmosphere through a 20 meter stack.

Inorganic wastes such as acids, alkalies and heavy metal bearing liquids are treated by physical/chemical processes such as neutralization, oxidation, reduction and precipitation. This plant, designed to treat 4000 tonnes per year, consists of two dedicated reactor systems with their associated pumps, agitators and controls. One of the reactor systems is polypropylene lined allowing it to handle acidic materials. The other is lined with teflon and is used for the treatment of alkalines, cyanides and sulphides. All treatments are first formulated in the laboratory prior to full scale treatment. Resulting solids and sludges are separated from liquids using a filter press. The filter cake is then further processed at the stabilization plant and the treated wastewater is pumped down the deepwell.

Treatment residues and low level contaminated solids are treated in the stabilization unit. Chemicals such as lime or fly ash are mixed with the waste materials to immobilize contaminants. Materials requiring stabilization are fed via a front end loader and skiphoist to the pug mill batch type mixer. Stabilized materials are then discharged into a truck for placement in the landfill cell. Treatments are first formulated in the laboratory prior to full scale treatment.

The secure landfill is comprised of a series of cells excavated in a 15 meter thick layer of dense clay. Only dry, treated, solid residues are ultimately disposed of in the cells. Further, the cell is covered with a portable, rigid structure during its operational life to ensure that no precipitation enters the cell. When a cell has been filled, it is capped with a plastic liner and clay. The surface is then revegetated.

The disposal well is drilled to a depth of 2045 meters and receives treated wastewaters from the physical/chemical treatment facility as well as incinerator scrubber blowdown and excess surface water runoff.

Operations

The treatment centre's first year of operations focussed on attaining a full operating licence. The first 3 months following the plant's official opening was spent on mechanically commissioning and verifying unit operations.

On February 1, 1988 a 5 month long performance evaluation program was initiated to determine the incinerators destruction and removal capabilities as well as to determine emission levels for the stack gases. The program was designed to evaluate the system performance against regulatory criteria set out by Alberta Environment and design criteria guaranteed by the incinerator manufacturer.

Alberta Environment specified maximum allowable stack gas concentrations as follows:

Total Particulate	70 mg/m^3
HCl	150 mg/m^3
SO_2	650 mg/m^3
HF	7 mg/m^3
CO	140 mg/m^3
PCBs	1 mg/kg PCB in feed
Sum of dioxins and furans	45 $nanogram/m^3$

These concentrations are based on 1 hour average emission rates referenced at 25°C, 101.325 kPa and 50% excess air on a dry basis.

The first two trial burns demonstrated the general capabilities of the system using what turned out to be the most difficult to destroy compound or principal organic hazardous constituent. Subsequent tests using four principal organic hazardous constituents demonstrated that system performance meets and often exceeds, by a substantial safety margin, the design specifications and regulatory requirements. The tests have also demonstrated the preferred operating conditions which lead to the best overall system performance.

Some of the more significant test results are summarized below:

Test Condition	Design Capacity 1200°C	126% Design Capacity 1125°C
DRE-trichlorobenzene	99.99999%	99.9999%
-PCB	99.99999%	99.99999%
Emissions (mg/m^3)		
Particulates	11.1	59.9
CO	10	10
HCl	4.8	0.93
total dioxins (ng/m^3)	BDL*	2.5
total furans (ng/m^3)	BDL	2.0

* BDL = below detectable limit

Following a number of months of data interpretation and a detailed review by Alberta Environment, a full operating licence was issued on November 1, 1988. The Alberta Special Waste Treatment Centre is thus Canada's first facility licenced to destroy PCBs.

In only seven months of full plant operations the demand for solid waste incineration has increased significantly. This, coupled with higher than expected BTU value waste streams has lead to an early decision to expand our incineration capabilities. Work is commencing on the procurement and installation of a small rotary kiln to deal with this shift in waste streams.

Collection and Transfer

Major producers of hazardous waste can now readily access the treatment centre.

Our studies show that 80 to 85% of all wastes destined for the treatment centre will be shipped directly from the point of generation. While this is effective for large volume generators, producing full truck loads of waste, it does not adequately address the collection of wastes from small quantity waste generators.

Current efforts in furthering development of a comprehensive waste management system are being directed towards the establishment of a network of regional collection and transfer stations.

Two interim transfer stations currently exist, one in the Calgary area, the other near Edmonton. These two regions, being the provinces largest industrial centres, are expected to handle about half of all those materials which will be routed through transfer stations.

Transfer stations allow small quantity generators ready access to the system by allowing them to deliver materials to the transfer station directly or through using the services of a waste broker or agent. These materials are collected and temporarily stored at the transfer station until a sufficient volume of compatible wastes has been accummulated to make up a truckload for shipment to the treatment centre.

Seminars and workshops have been held throughout the province to inform waste generators and the general public of Alberta's Special Waste Management System. Initially, to encourage the participation of the private sector, we specifically addressed small businesses to highlight the new regulations as well as highlighting the various potential business opportunities.

More recently, study sessions have been initiated in interested communities (with town councils support) with a group of non-elected citizens. The corporation's objectives in conducting these sessions is to increase the general publics understanding of hazardous wastes and to gain their support in the development of a comprehensive management network. These citizens groups are ultimately responsible for reporting back to their town council on their findings and recommendations regarding hazardous waste management on a local scale.

In conjunction with these study sessions, public involvement and awareness has been greatly increased through the development and implementation of a province wide program for the collection of household hazardous waste as well as for old and expired medications.

A 30-second television commercial and a 30-minute documentary have both been aired extensively throughout the province. Efforts are now being made to have hazardous waste management considered in the new junior-highschool environmental studies curriculum.

Through the continued use of public meetings, presentations and programs such as the household toxic round-ups, the ASWMC hopes that all Albertans will soon recognize both the need for proper waste management, and their responsibility for ensuring it happens.